REMARKS

This is a full and timely response to the outstanding non-final Office Action mailed January 17, 2008. The Examiner is thanked for the thorough examination of the present application. Upon entry of this response, claims 1, 3-10, 12-23 and 25-27 are pending in the present application. Claims 1, 4, 5, 7-9, 13-15, 17, 19-21, 23, and 25-27 are rejected under 35 U.S.C. §103(a) as allegedly being anticipated by *Voorhies* (U.S. 00702343B1, hereinafter "*Voorhies*") in view of *Orenstein* (U.S. 006580427B1, hereinafter "*Orenstein*"). Claims 3, 6, 10, and 18 are rejected under 35 U.S.C. §103(a) as allegedly being anticipated by *Voorhies*, in view of *Orenstein*, further in view of Gannett (U.S. Pat. No. 6,118,452). Claims 12, 16, and 22 are rejected under 35 U.S.C. §103(a) as allegedly being anticipated by *Voorhies*, in view of *Orenstein*, further in view of *Griffin* (U.S. Pat. No. 5,990,904). Applicants respectfully request consideration of the following remarks contained herein.

I. Response to Claim Rejections Under 35 U.S.C. § 103

The USPTO has the burden under section 103 to establish a *prima facie* case of obviousness according to the factual inquiries expressed in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). The four factual inquires, also expressed in MPEP §2141, are as follows:

(A) Determining the scope and contents of the prior art;

(B) Ascertaining the differences between the prior art and the claims in issue;

(C) Resolving the level of ordinary skill in the pertinent art; and

(D) Evaluating evidence of secondary considerations.

For a proper rejection of the claim under 35 U.S.C. §103, the cited combination of references must disclose, teach or suggest all elements / features of the claim at issue. See, e.g., *In re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988) and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981). For at least the reasons set forth below, Applicants traverse the rejections set forth in the present Office Action.

A. Claims 1, 3-7

Applicants respectfully submit that independent claim 1 patently defines over *Voorhies* in view of *Orenstein* for at least the reason that the combination fails to disclose, teach or suggest the features emphasized below in claim 1.

Claim 1 recites:

> 1. A multi-pass method of rendering a plurality of graphic primitives comprising:
> in a first pass:
> passing only a limited portion of graphic data for each primitive through a graphic pipeline, wherein the limited portion of graphic data comprises location-related data;
> processing the limited portion of graphic data to build a compressed z-buffer, the compressed z-buffer comprising a plurality of z-records, each z-record embodying z information for a plurality of pixels such that condensed depth information for the plurality of pixels is represented by a single z-record;
> setting a visibility indicator, for each primitive, if any pixel of the primitive is determined to be visible;
> in a second pass:
> for each primitive, determining whether the associated visibility indicator for that primitive is set;
> discarding, without passing through the graphic pipeline, the primitives for which the associated visibility indicator is not set;
> passing the remaining portion of graphic data for each primitive determined to have the associated visibility indictor set;

> ***performing a two-level z-test on graphic data, wherein a first level of the z-test compares the graphic data of a current primitive with corresponding information in the compressed z-buffer, and wherein a second level of the z-test is performed on a per-pixel basis in a z-test manner, wherein the second level z-test is performed only on pixels within a record of the compressed z-information in which the first level z-test determines that some but not all pixels of an associated macropixel are visible***; and
> communicating data associated with pixels of macropixels determined to be visible to a pixel shader for rendering.

(Emphasis added.) In the "Response to Arguments" section, the Examiner maintains that the *Voorhies* reference discloses the feature emphasized above. Applicants continue to disagree, however, and submit that while *Voorhies* teaches of a z-test, *Voorhies* fails to teach fails to disclose certain elements in claim 1. In particular, *Voorhies* fails to teach performing a two-level z-test on graphic data as recited in claim 1, wherein:

> *a first level* of the z-test compares the graphic data of a current primitive with
> corresponding information in the compressed z-buffer, and
> *a second level* of the z-test is performed on a per-pixel basis in a z-test manner,
> **where the second level z-test is performed *only on pixels* within a record of the compressed z-information in which the first level z-test determines that some but not all pixels of an associated macropixel are visible.**

The Examiner continues to rely on the following reasoning: "*Fig. 11 in Voorhies shows flowchart of z-test, and shows z-test (1114) is first performed on one level, and if that level is not the finest level (1118), the z-test process loops back to the beginning and repeats the z-testing process for the next finest level . . .*" (Office Action, page 3). The "levels" disclosed in the *Voorhies*

reference relate to different levels in a z-pyramid and not to a two-level z-test. *Voorhies* further teaches that "[s]ince a z-pyramid has a plurality of levels which are each a depth buffer, it can also be described as a hierarchical depth buffer." (Col. 8, lines 56-58).

Claim 1 defines a first level z-test, a second z-test and that the second level z-test is performed only on pixels within a record of the compressed z-information in which the first level z-test determines that some but not all pixels of an associated macropixel are visible. *Voorhies* fails to teach this limitation. The Examiner asserts that "the z-test process loops back to the beginning and repeats the z-testing process for the next finest level." *Voorhies*, however, fails to teach that a second z-test is performed only on pixels within a record of the compressed z-information in which the first level z-test determines that some but not all pixels of an associated macropixel are visible. The Examiner asserts that *Voorhies "teaches second "iteration" of z-test is performed on per-pixel basis in z-test manner, and this is how second level of z-test is defined."* (Note: Applicants assume that the Examiner actually meant to refer to the *Voorhies* reference rather than the *Orenstein* reference at the bottom of page 3 as the surrounding discussion relates to the *Voorhies* reference.) Even assuming, for the sake of argument, that *Voorhies* teaches the first level and second level recited in claim 1, the Examiner fails to indicate where *Voorhies* teaches the limitation, "where the second level z-test is performed only on pixels within a record of the compressed z-information in which the first level z-test determines that some but not all pixels of an associated macropixel are visible." The

Examiner only asserts that "*[i]f that level is not the finest, z-testing is then processed for next finest level . . . this is considered to be second level of the z-test.*" (Office Action, page 5). This, however, is not equivalent to the limitations recited in claim 1. Further, the secondary *Orenstein* reference fails to address this deficiency in the *Voorhies* reference.

In view of the foregoing, Applicants respectfully submit that independent claim 1 patently defines over *Voorhies* in view of *Orenstein* for at least the reason that the combination fails to disclose, teach or suggest the highlighted features in claim 1 above. Applicants submit that dependent claims 3-7 are allowable for at least the reason that these claims depend from an allowable independent claim. *See, e.g., In re Fine*, 837 F. 2d 1071 (Fed. Cir. 1988).

B. Claims 8-10, 12

Applicants respectfully submit that independent claim 8 patently defines over *Voorhies* in view of *Orenstein* for at least the reason that the combination fails to disclose, teach or suggest the features emphasized below in claim 8.

Claim 8, as amended, recites:

> 8. A method of rendering a plurality of graphic primitives comprising:
> passing, within a graphic pipeline, only a limited portion of the graphic data associated with each primitive, wherein the limited portion of graphic data comprises location-related data; and wherein each primitive comprises a plurality of pixels;
> processing the limited portion of graphic data associated with each individual primitive to build a compressed z-buffer for each primitive, wherein each compressed z-buffer contains a plurality of z-records which each contains compressed z-information for a macro-pixel;

> ***creating a visibility mask for each primitive, wherein for each primitive, the visibility mask indicates whether the primitive is clipped, culled, or is a zero-pixel primitive***;
>
> determining, for each primitive, whether the primitive has at least one visible pixel based on the visibility mask;
>
> communicating data associated with pixels of primitives determined to have at least one visible primitive to a pixel shader for rendering; and
>
> passing and processing, within the pixel shader, the remaining graphic data associated with each primitive only for those primitives determined to have at least one visible pixel, wherein the remaining graphic data includes at least one of the following: lighting, texture, and fog data.

(Emphasis added.) Applicants respectfully submit that claim 8, as amended, is allowable over the cited art for at least the reason that neither *Voorhies* nor *Orenstein*, alone or in combination, discloses, teaches, or suggests "creating a visibility mask for each primitive, wherein for each primitive, the visibility mask indicates whether the primitive is clipped, culled, or is a zero-pixel primitive." The Examiner admits on page 13 of the Office Action that neither *Voorhies* nor *Orenstein* teaches a "zero-pixel" but alleges that the *Griffin* reference (U.S. Pat. No. 5,990,904) discloses this feature. Applicants disagree as the text cited in the *Griffin* fails to disclose "zero-pixels". Portions of the text passages cited by the Office Action are reproduced below:

> [I]t is clear that discrete pixels cannot precisely represent continuous surfaces. For example, a polygon may only partially cover a pixel region. . . A technique known generally as anti-aliasing attempts to address this problem. In general, anti-aliasing is used to compute pixel intensities for partially covered pixels to reduce the discontinuities introduced by representing a continuos [sic] object with a discrete array of pixels.

(Col. 2, line 61-col. 3, line 5).

> The pixel engine performs a depth compare operation on newly generated pixel data. If a generated pixel is occluded by the pixel in the pixel buffer, it is discarded. If the generated pixel is a fully

> covered pixel and is not occluded by the pixel in the pixel buffer, it replaces the pixel in the pixel buffer. . . .

(Col. 5, lines 26-42) While the *Griffin* reference discusses use of anti-aliasing, nowhere does *Griffin* disclose, teach, or suggest the concept of a "zero-pixel".

Accordingly, Applicants respectfully submit that independent claim 8 patently defines over *Voorhies* in view of *Orenstein* for at least the reason that the combination fails to disclose, teach or suggest the highlighted features in claim 8 above. Applicants submit that dependent claims 9-10, 12 are allowable for at least the reason that these claims depend from an allowable independent claim. *See, e.g., In re Fine*, 837 F. 2d 1071 (Fed. Cir. 1988).

C. ***Claim 13***

Applicants respectfully submit that independent claim 13 patently defines over *Voorhies* in view of *Orenstein* for at least the reason that the combination fails to disclose, teach or suggest the features emphasized below in claim 13.

Claim 13, as amended, recites:

> 13. A method of rendering a plurality of graphic primitives comprising:
>
> passing in a first pass, within a graphic pipeline, only a limited portion of graphic data for each primitive, wherein each primitive comprises a plurality of pixels and wherein the limited portion of graphic data comprises location-related data;
>
> processing the limited portion of graphic data to build a compressed z-buffer, the compressed z-buffer comprising a plurality of z-records, each z-record embodying z information for a plurality of pixels such that condensed depth information for the plurality of pixels is represented by a single z-record;
>
> in a second pass, within the graphic pipeline, ***performing a two-level z-test on graphic data, wherein a first level of the z-test compares the graphic data of a current primitive with corresponding information in the compressed z-buffer, and***

> ***wherein a second level of the z-test is performed on a per-pixel basis in a z-test manner, wherein the second level z-test is performed only on pixels within a record of the compressed z-information in which the first level z-test determines that some but not all pixels of a macropixel are visible***, wherein additional graphic data associated with each primitive is passed into the graphics pipeline on the second pass only for primitives that are at least partially visible; and
>
> communicating data associated with pixels of macropixels determined to be visible to a pixel shader for rendering.

(Emphasis added.) In alleging that *Voorhies* teaches the feature emphasized above in claim 13, the Office Action cites substantially the same text passages cited for claim 1. Applicants submit that *Voorhies* fails to teach of performing a two-level z-test and in particular, fails to teach the limitation, "wherein the second level z-test is performed ***only*** on pixels within a record of the compressed z-information in which the first level z-test determines that some but not all pixels of a macropixel are visible". Further, the *Orenstein* reference fails to address this deficiency in *Voorhies*. Accordingly, Applicants respectfully submit that independent claim 13 patently defines over *Voorhies* in view of *Orenstein* for at least the reason that the combination fails to disclose, teach or suggest the highlighted features in claim 13 above.

D. Claims 14-22, 25-27

Applicants respectfully submit that the combination of *Voorhies* and *Orenstein* fails to teach, disclose or suggest at least "logic configured to create a visibility mask for each primitive, wherein for each primitive, the visibility mask indicates whether the primitive is clipped, culled, or is a zero-pixel primitive" as recited in independent claims 14 and 21. The Examiner admits on page 13 of the Office Action that neither *Voorhies* nor Orstein teaches of a "zero-pixel" but alleges that the *Griffin* reference (U.S. Pat. No.

5,990,904) discloses this feature. Applicants submit that *Griffin* fails to teach of "zero-pixels" as nowhere in the cited text does *Griffin* disclose, teach, or suggest the concept of a "zero-pixel". Instead, the cited text is directed to anti-aliasing techniques. Accordingly, Applicants respectfully submit that independent claims 14 and 21 patently define over *Voorhies* in view of *Orenstein* for at least the reason that the combination fails to disclose, teach or suggest certain features in these claims. Applicants submit that dependent claims 15-20, 22, and 25-27 are allowable for at least the reason that these claims depend from allowable independent claims. *See, e.g., In re Fine*, 837 F. 2d 1071 (Fed. Cir. 1988).

Conclusion

Applicants respectfully submit that all pending claims are in condition for allowance. Favorable reconsideration and allowance of the present application and all pending claims are hereby courteously requested. If, in the opinion of the Examiner, a telephone conference would expedite the examination of this matter, the Examiner is invited to call the undersigned attorney at (770) 933-9500.

No fee is believed to be due in connection with this amendment and response to Office Action. If, however, any fee is believed to be due, you are hereby authorized to charge any such fee to deposit account No. 20-0778.

Respectfully submitted,

/Daniel R. McClure/

Daniel R. McClure
Reg. No. 38,962

THOMAS, KAYDEN, HORSTEMEYER & RISLEY, L.L.P.
600 Galleria Parkway SE
Suite 1500
Atlanta, Georgia 30339
(770) 933-9500